REMARKS

Applicant respectfully submits that the claims on file have been amended to more clearly point out the present invention. All the claims presently on file are in condition for allowance, which allowance is earnestly solicited.

THE CLAIMS

CLAIM REJECTION - 35 USC 112, Second Paragraph

Claims 15-20 were rejected under 35 U.S.C. 112, Second Paragraph, on the ground that claim 15 contains an informality. Such informality has now been addressed.

CLAIMS REJECTION UNDER 35 U.S.C. 103

A. The Rejection

Claims 1-26, were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. publication No. 2002/0052692 issued to Fahy, in view of U.S. Patent No. 6,636,862 issued to Lundahl et al. (hereinafter referred as Lundahl).

Applicant also believes that the anticipation rejection of claims 1-10 and 15-26 was added in error under the heading of the obviousness

rejection, and thus it will not be addressed.

Applicant respectfully submits that the cited references do not disclose all the elements and limitations of the claims on file as a whole. Consequently, the claims on file are not obvious under 35 U.S.C. 103, and the allowance of these claims is earnestly solicited.

Applicant agrees with the Examiner that "Fahy does not specifically disclose the details of determining the characteristic value comprises calculating the attribute values of the attribute across the records."

In order to find a substitute for the missing element of claim 1, the Examiner resorts to Lundahl, indicating that: "Lundahl gives the details to determine the characteristic value comprises calculating the attribute values of the attribute across the records [e.g., col. 2, lines 36-55, Fig.(s) 2-6 and associated texts]."

Applicant will now present arguments in support of the allowance of representative independent claim 1 and its dependent claim 11, and the claims dependent thereon, over Fahy.

Applicant has amended claim 1 to clarify that the key comprises an ordered list of the set of attributes and the deviations; and that **refining the clustering result includes selectively changing a length of the key to change the number of the clusters**. In other term, the clustering refinement is derived from the length of the key that can be selectively changed to change the

number of the clusters. Neither Fahy nor Lundahl discloses such a direct causal relationship between the key length and the number clusters on the clustering result.

In rejecting claim 1, the Examiner indicates that Fahy describes: "for each attribute of the set of attributes, determining a characteristic value for said each attribute, based on attribute values of said each attribute [e.g., the steps: 211-¬214, Fig. 3]."

In response, Applicant has reproduced below, paragraphs [0045] and [0046] that describe step 212 (not 211 as indicated by the Examiner) through step 214 in connection with Fig. 3 of Fahy:

> "[0045] Once a test matrix is chosen for hierarchical clustering, the depicted embodiment uses the procedure 200 as shown in FIG. 3 to hierarchical cluster the test matrix. The hierarchical clustering procedure 200 begins at step 210 and proceeds to step 212 where a test matrix is inputted into or received by the personal computer 100 for analysis. In the depicted embodiment, test matrices are inputted in ASCII text file format. Alternative embodiments use other file formats for test matrix input.
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> [0046] In step 214, the procedure 200 preconditions the test matrix by assigning the test subject rows of the test matrix to nonhierarchical clusters. Nonhierarchical clustering forms the test subject rows into separate groups or clusters, but does not order these clusters in a hierarchy. During nonhierarchical clustering, the nonhierarchical clusters remain independent from one another and are not associated with each other or clustered together to form larger clusters. Under the depicted embodiment, the procedure 200 uses **K-means clustering, which is a conventional nonhierarchical clustering method**. In particular, for the depicted embodiment, the procedure 200 uses a known Linux freeware statistical software package entitled "R" to perform the K-means clustering under step 214. Further

> information on R is found on the Internet at http://lib.stat.cmu.edu/R/." Emphasis added.

Applicant respectfully submits that the Examiner did not specify what is considered to be a **characteristic value** for each attribute. Nonetheless, Applicant will presume, to the best of his understanding, that the K-mean value is considered to be the characteristic value.

In addition, the Examiner indicates that Fahy describes: "for each attribute value, determining a deviation from the characteristic value of said each attribute [e.g., the use of K-mean Euclidean distance technique at Paragraph 0047]."

In response to this rejection ground, Applicant has reproduced below, paragraph [0047]:

> "[0047] The K-means clustering procedure uses a preselected number, K, as the number of clusters to form. The K-means clustering procedure then produces exactly K different clusters of the test sample rows of greatest possible distinction. The K-means procedure tests a number of different groupings of the test subject rows into nonhierarchical clusters to search for a set of clusters that maximizes the similarity of all the test sample rows assigned to the same cluster. At the same time, **the K-means procedure maximizes the statistical distance or differences between individual clusters**. The depicted embodiment uses Euclidean distances between the various gene activity values of the test subject rows of a test matrix to determine distances between the test sample rows. The K-means clustering procedure under the above embodiment then uses a value for K of 200 for test matrices of approximately 20,000 test subject rows. When using the K-means procedure under the R statistical package, the results are then formatted using the Perl scripting language for input into the next step of the overall hierarchical clustering procedure. Perl is a conventional UNIX utility well known in the art. Pern is an interpreted language directed to system management tasks and other aspects

directed to scanning computer files, extracting information from those files, and printing and formatting the files based on that information. Emphasis added.

Applicant respectfully submits that Fahy provides the following definition: **the K-means procedure maximizes the statistical distance or differences between individual clusters**. In other terms, the "distance" refers to the difference between individual clusters, and not, as taught by the present invention, the deviation from the characteristic value of said each attribute (as recited in claim 1). It being understood that Fahy does not calculate the deviation of each attribute from the characteristic value (or as presumed above, the "K-mean value".

In addition, the Examiner indicates that Fahy describes: "for each record, sorting the set of attributes based on deviations of the attribute values, to provide a key [paragraph 0064-0065, Units: 224, 226, Fig. 3]."

In response to this rejection ground, Applicant has reproduced below, paragraphs [0064], [0065], [0075], and claim 1 of Fahy:

"[0064] In step 222 of FIG. 3, the expanded test matrix is imported into a spreadsheet program such as Microsoft Excel. The test matrix rows of the test matrix are then **sorted based on their hierarchical assignment values** in step 224. In step 226, color is assigned to each measurement value of each test matrix row based upon what range each value falls in. The above embodiment uses a Visual Basic macro for color-coding, as explained below.

[0065] FIG. 4 illustrates a portion of an expanded test matrix as displayed in a user interface contained in a spreadsheet 400 after the individual values of the expanded test matrix have been color coded. In FIGS. 4, 6, 8, and 9 various colors are represented symbolically rather than being displayed. In the depicted embodiment, a symbolic approach is used. In

alternative embodiments, actual colors are displayed to indicate the range that each measurement value falls in. For instance, referring **to key 410, the ranges "1 to 10," "0.845 to 1," "0.602 to 0.845," "0.301 to 0.602," "-0.301 to 0.301," -0.301 to -0.602," "-0.602 to -0.845," "-0.845 to -1," and "-1 to -10"** can be represented by the colors red, dark orange, light orange, yellow, white, light blue, dark blue, indigo, violet, respectively. Other embodiments use other color mappings between numerical ranges and colors.

[0075] In step 232 of FIG. 3, the procedure 200 imports the expanded test matrix into a structured query language (SQL) database program such as an Oracle database. Under the above embodiments, the procedure 200 imports the **hierarchical and nonhierarchical assignment data** into a database containing raw gene array data. In step 234, the procedure 200 runs database queries by cluster assignments and ranking. An example of an input screen using a Web browser such as Netscape is shown in FIG. 7. Alternative embodiments include queries available under SQL or other types of query languages.

Claim 1. A system for analyzing information based on measurements of at least one measurement type, a measurement of each measurement type performed on each of a plurality of biological test subjects, the system comprising: an input component configured to receive a data file of a test matrix containing sets of **measurement values, each set of measurement values containing a measurement of each measurement type for one of the plurality of biological test subjects**; a pre-conditioning component configured to assign each of the sets of measurement values to one of a plurality of nonhierarchical clusters, at least one of the nonhierarchical clusters having more than one set of measurement values assigned; a reduction component configured to generate a data file of a reduced test matrix from the data file of the test matrix, the reduced test matrix containing one set of representative values associated with each nonhierarchical cluster, each set of representative values based on the sets of measurement values assigned to the nonhierarchical cluster associated with the each set of representative values; and a hierarchical clustering component configured to order the sets of representative values into hierarchical clusters." Emphasis added.

Applicant respectfully submits that the sorting according to Fahy is performed **based on the hierarchical assignment values**, where "color is assigned to each measurement value of each test matrix row based upon what range each value falls in." It is not clear whether the Examiner analogizes the color to be the "key" recited in the instant claim 1.

In addition, although Fahy uses the term "key 410", the word "key" in general has a very broad meaning, and it must be defined specifically in the context in which it is used. As illustrated in Fig. 4 and in paragraph [0065] of Fahy, key 410 (or ranges) is not the same or similar to the key of the instant application, reference is made to paragraph [0022] of the instant specification, which is reproduced below, with emphasis added:

> "[0022] In step 104, the deviations that have been obtained for each of the records are used as a basis for sorting the attributes of this record. For example, the attributes are sorted in ascending or descending order of the deviations. In this manner, **a key comprising an ordered list of attributes and associated deviations is provided for each one of the records**."

In addition, the Examiner indicates that Fahy describes: "clustering the set of records based on the key [Fig. 4 and associated text starting at paragraph 0072 at seq.]."

In response to this rejection ground, Applicant has reproduced below, paragraph [0072]:

> "[0072] FIG. 6 shows a portion of a spreadsheet 600 of an expanded reduced test matrix that corresponds with the expanded test matrix of spreadsheet 400. The expanded reduced test matrix of spreadsheet 600 gives a focused view of how the procedure 200 orders the nonhierarchical clusters of the expanded test matrix of spreadsheet 400

under the hierarchical clustering, such as how HClust orders the K means data. In spreadsheet 600, column A contains the nonhierarchical cluster assignment numbers. Columns B-E of spreadsheet 600 contain mean values for each nonhierarchical cluster of the measurement values found in columns B-E of spreadsheet 400. For example, in spreadsheet 400 for nonhierarchical cluster 70, all the measurement values in columns B-E are in the same range of values greater than 10. In spreadsheet 600, each mean value of the expanded reduced test matrix row for nonhierarchical cluster 70 corresponds to the mean value of a column of the nonhierarchical cluster 70." Emphasis added.

Applicant respectfully submits that while according to the present invention, clustering is performed based on the key, Fahy clusters based on the K means value, which is not the same as the "key" of the present invention. To reiterate the argument presented earlier, if the Examiner considers the "K-mean value" to be analogous to the characteristic value, then Fahy's clustering is implemented according to the characteristic value and not based on the Key that is provided based on the sorting of the attributes based on the deviations of the attribute values.

Applicant submits that the referenced text of Lundahl does not describe the features and elements of claim 1, in particular, there is no disclosure of the following element in claim 1, as amended: "the key comprises an ordered list of the set of attributes and the deviations; and that refining the clustering result includes selectively changing a length of the key to change the number of the clusters."

As a result, the hypothetical combination of Fahy and Lundahl will not consider the present invention as a whole, necessitating the finding of non-compliance with the foregoing legal standard. Reference is made to the following legal authority in support of the finding of non-obviousness:

> "**In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103** is not whether the differences themselves would have been obvious, but **whether the claimed invention as a whole would have been obvious**..." 713 F.2d at 785, 218 USPQ at 700."

Applicant respectfully submits that the cited references **do not provide any reasonable teaching or suggestion** to support modifying the cited references in order to refine the clustering, and as recited for example, in claims 1 and 11. The Examiner indicates that "it would have been obvious for an ordinary skilled person in the art at the time the invention was made to apply the detailed Lundahl's determination processing in Lundahl's system, because by doing so, as suggested by Lundahl, the combined invention will including the dynamically analysis of data that builds into the calculation of a series of computational steps archived through the use of a digital computer program and allows for the incorporation of the respective independent qualities of objects into models, and thereby

defines predictive relationships between independent objects [Lundahl: col. 2, lines 8 – lines 55]."

However, building into the calculation of a series of computational steps archived through the use of a digital computer program and allowing for the incorporation of the respective independent qualities of objects into models, to define predictive relationships between independent objects" cannot be analogized to the object of claim 11, namely to "reduce the total number of clusters" as recited in claim 11. As a result, the combination of Fahy and Lundahl is untenable.

Consequently, The Examiner has not met the *prima facie* burden of supporting the obviousness rejection under 35 USC 103, and the hypothetical combination of the cited references cannot be used to support a finding of obviousness, as indicated by the legal authorities below:

> "**Obviousness cannot be established** by combining the teachings of the prior art to produce the claimed invention, **absent some teaching or suggestion** supporting the combination." *In re Fine, 837 F.2d at 1075, 5 USPQ2d at 1598* (citing *ACS Hosp. Sys. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984)*). **What a reference teaches** and whether it teaches toward or **away from the claimed invention** are questions of fact. See *Raytheon Co. v. Roper Corp., 724 F.2d 951, 960-61, 220 USPQ 592, 599-600 (Fed. Cir. 1983),* cert. denied, *469 U.S. 835, 83 L. Ed. 2d 69, 105 S. Ct. 127 (1984).*"
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> "When a rejection depends on a combination of prior art references, there must be **some teaching, suggestion, or motivation** to combine the references. See *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987)." Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention

> **where there is some teaching, suggestion, or motivation** to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See MPEP 2143.01; In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000); In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); and In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)."

Claims 1 and its dependent claim 11 are thus not obvious in view of the cited references, and the allowance of these claims and the claims dependent thereon, is earnestly solicited. Independent claims 15 and 21 are allowable for containing a generally similar subject matter to that of claim 1. Therefore, claims 15 and 21 and the claims dependent thereon, are also allowable.

CONCLUSION

All the claims presently on file in the present application are in condition for immediate allowance, and such action is respectfully requested. If it is felt for any reason that direct communication would serve to advance prosecution of this case to finality, the Examiner is invited to call the undersigned at the below-listed telephone number.

Respectfully submitted,

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